

Abstract Title Page

Title: The Impacts of an Integrated Community Development Program in Southern Ethiopia— A Propensity Score Analysis

Authors and Affiliations: Ning Rui, Westat

Abstract Body

Background / Context:

With funding through grants and donations, an international development organization has provided developmental services to a woreda in southern Ethiopia since the early 1980s. The work started with relief interventions to provide food and health care to the region, followed by rehabilitation programming, which was intended to reduce migration, dislocation, and preserve basic assets. In 1996, a developmental approach, the Community Development Technical Program (CDTP), was adopted in order to address the root causes of poverty by developing local capacities of sustainable development.

Many community development programs in developing countries are geared to agricultural development. Although a holistic approach is adopted sometimes, it is challenging to address social and educational improvement of the whole community, which often results in unbalanced development. Mitchnik (1968) argued that this unbalanced development often failed to address the root causes of poverty and led to much wastage of resources and funds.

Besides services intended to benefit the community as a whole, it is assumed that benefits are expected to ripple from direct beneficiaries to indirect or non-beneficiaries. The main vehicle by which program benefits ripple from direct to indirect benefits include geographical propinquity and social interaction- among individuals, families and groups (e.g. Owen-Smith & Powell, 2004; Ahuja, 2000; Moody & White, 2003 Chandrasekhar, Kinnan & Larreguy, 2011). Households that are closer are more likely to interact and exchange information than distant ones. However, some relationships go beyond geographical ties, hence the possibility of interactions among households distant from each other. Even without interactions and exchange of information among households, geographical proximity may elicit program benefits. Studies show that as the number of healthier families increases in a community, there is reduced transmission of preventable illnesses (Miguel & Kremer, 2004; Hotez & Pritchard, 1995).

Another theory that emphasizes the importance of social interactions is the Community Capitals Framework (CCF). The CCF looks at community transformation from a systems perspective. Literature on the community capitals approach shows that when there are assets created within a community (e.g., food, health and education), the interactions among these assets can initiate an ongoing process of assets building on assets, leading to the effect of an upward spiral (e.g. Aigner, Flora & Hernandez, 2001; Emery & Flora, 2006; Falk & Kilpatrick, 1999). This implies that interactions among more endowed households (e.g. direct beneficiaries) yield a greater synergy of benefits than the interaction among less endowed households (non-beneficiaries).

Purpose / Objective / Research Question / Focus of Study:

This study is intended to assess the outcome and impact of the program and address the following questions:

1. Did direct beneficiaries of the CDTP program exhibit better program outcomes than indirect beneficiaries; if so, to what extent has participation in the CDTP program led to increased economic, health, and education related outcomes for sponsored households and youth?

2. What are the pathways through which program effects ripple from direct to indirect beneficiaries?

Setting: A woreda in southern Ethiopia.

Population / Participants / Subjects:

There were three program phases with a set of objectives for each phase (see Table 1). The program team collected survey data about the demographic characteristics, education, crop production, household economy, awareness of environmental protection and land rehabilitation technology, sanitation, immunization, illness prevention and treatment from 659 households as well as information regarding food security, health, and schooling from 382 teenagers. The survey respondents include those who reside within the sponsorship kebeles (an administrative unit) with or without a Registered Child (RC) as well as those who are outside the sponsorship kebeles.

Intervention / Program / Practice:

The program or treatment variable in this study is the Community Development Technical Program (CDTP), which was adopted in order to address the root causes of poverty by developing local capacities of sustainable development in the woreda under study.

Research Design:

A quasi-experimental comparison-group design was applied to assess the impacts of the program on sponsored households and children. The comparison group would be disaggregated into multiple subgroups based on the “dosage” of services received. Admittedly, the two groups are nonequivalent even with a matching procedure because it is expected that they may differ on some unmeasured characteristics prior to the program. However, this is the best design available when randomized controlled trial is not appropriate. The evaluator would make sure that the available demographic characteristics of the treatment and comparison groups look as closely as possible.

Data Collection and Analysis:

The sample sizes of the three clusters, as defined by the program implementation team, are illustrated in Table 2. The three clusters represent the three subsamples who received different dosage of services. The treatment group is Cluster C, which includes the households that received the sponsorship and have at least one registered child. Cluster B are those households within the same kebeles of households in Cluster C but don't have any registered children. Households in Cluster A are outside the sponsorship kebeles. It is likely that households in Cluster A learned about and benefited indirectly from the services.

A power analysis was conducted with an assumed attrition rate of 10% and minimum detectable effect size of .20. At least 197 cases in each group are required to achieve a statistical power of 80%. Assuming an attrition rate of 10%, a total of 219 cases (197/90%) are required for each group to achieve 80% of statistical power. Since there are three clusters of households, a total of 657 (219x 3) cases are required. The program team collected survey data from a total of 659 households and hence met this requirement.

This study aims to estimate the effect of CDTP program on youth's literacy and attitudinal outcomes using the survey data of 398 youth respondents aged 12 to 18. To achieve this goal, propensity score matching (Rosenbaum & Rubin, 1983) was applied to make sure that the registered children and non-registered children were approximately equivalent on their baseline individual and household characteristics. The propensity score is defined as a single subject's probability of receiving treatment given the covariate values. The purpose of matching is to select a subset of the control units with covariate values similar to those for the treated units (Cook & Campbell, 1979). Chi-square test was performed to determine the statistical significance of inter-cluster differences for the categorical outcome variables. The following data were collected:

1. Household characteristics survey administered to each individual member of both the treatment and comparison households ($N= 4,075$ individual respondents);
2. Post-intervention household-level demographic, economic, and health survey for both treatment and comparison households ($N= 659$ households);
3. Post-intervention survey on the production of crops administered to treatment and comparison households ($N= 1,653$ crops);
4. Post-intervention survey on immunization that was completed by the mother or principle caregiver for each child aged 0-59 months in both treatment and comparison households ($N= 738$ children).
5. Post-intervention youth survey and literacy assessment for any individuals aged 12-18 years old in both treatment and comparison households ($N= 382$ individuals).

Findings / Results:

The program team collected background information from a total of 4,075 residents. The average age of the head of household is 45 years old. About 84% of the heads of household are male. About 49% of them never went to school and only 3.2% had some postsecondary education. On average there were four children per family. Of the 113 respondents who were around 11 years old, 42% completed grade 4. Of the 159 children who were around 15 years old, about 28% completed grade 8. Girls' (24.4%) eighth-grade completion rate is seven percent lower than that for boys (30.9%). About 68% of teenagers aged 12 to 18 could not read or write. The illiteracy rate of the adults is 15% lower than that of the teenagers. Of a total of 1,896 children between 6 and 18 years old, about 66% were enrolled in schools. This enrollment rate is 9.5% higher for those who were between 12 and 18 years old (75.5%).

The most positive outcomes tend to center around the household agricultural and economic variables. The treatment Cluster (C) and Cluster B had more than 20% higher rate than the households outside the sponsorship region (A). The land size per capita for Cluster B is statistically greater than that for Cluster A. Cluster C had a higher percentage of irrigation practice (8.61%) in comparison with B (3.51%) and A (1.27%). The average production of maize for the treatment group is significantly greater than the households outside the sponsorship kebeles during the Belg season, after taking family size into consideration. The households within sponsorship kebeles, regardless of whether there is a RC, tend to have higher percentage of livestock ownership (84.92% for B and 81.85% for C) than those outside the sponsorship kebeles (65.64%). Those households with RC produced more milk per day than their counterparts without RC within the same region. Cluster C also had a food deficit rate that is about 6% to 11% lower (74.24%) than that for cluster A (80.52%) and B (85.38%). Cluster B

had the highest literacy rate (73.04%) for those aged 12-18. Cluster C had the highest median per-capita income at 279 Birrs compared to B (225 Birrs) and A (214 Birrs), but the differences are not statistically significant. About 66% of households in Cluster C reported being aware of these issues, which is 13.43% higher than those in A and 7.85% higher than the households in B ($p < .01$). About 36.43% of the caregivers in Cluster C reported having been trained on community disaster preparedness, which is 8.38% higher than those in Cluster A and 17.23% higher than those in Cluster B ($p < .01$).

Table 3 presents the list of selected matching variables that reflect the youth respondents' personal and family background information. The evaluator used the absolute value of the standardized difference between treatment and control groups to examine bias reduction before and after matching. According to Rosenbaum and Rubin (1983), there is covariate imbalance and matching is required if the absolute standardized difference is greater than 10. Following a strategy suggested by Rosenbaum and Rubin (1984), a propensity score model was built using stepwise logistic regression with the selected covariates.

Table 5 shows the improvement of covariate balance after the matching. The matching resulted in a subset of 116 control cases who matched closely with the 116 RCs. As shown in Table 4 and 5, the average standardized difference for all covariates was reduced from 11.26 to 5.17. The number of covariates with standardized difference above 10 has been reduced from 10 to 2, suggesting that the matching improved the covariate balance significantly.

The findings of OLS regression analysis of both the literacy outcome and outlook on life using matched data reveal that that after matching on the children's family and personal characteristics, the RCs did not exhibit better academic or attitudinal outcomes in comparison with children who were not RCs.

Conclusions:

This study links well with the conference theme of making sense of contradictory or mixed findings by examining the implementation and effectiveness of an integrated approach to community development and the need to address the root causes of poverty in developing countries. This study revealed some basic social and educational problems of the community, which have important implications on program improvement in the developing world. Findings from this study appear to align with Mitchnik's (1968) argument that unbalanced development often failed to address the root causes of poverty by developing the local capacities of sustainable community development. Although there appears to be evidence of improved agricultural techniques and yields, the literacy rate is still extremely low among adults and children in the region. Teenage girls appear to have a greater disadvantage in educational opportunities and attainment. This calls for more careful thinking and studies about the design and feasibility of integrated approach to programming. A major limitation in this study is that not sufficient baseline data (except for demographic characteristics) were collected, so it is unknown if there were other differences between the treatment and comparison groups that might confound the program effect. Future research needs to address to how efforts and resources from governmental and non-governmental sources can be utilized effectively to meet the needs of the existing inhabitants and lead to purposive and sustainable improvement.

Appendices

Appendix A. References

- Ahuja, G . (2000). Collaboration networks, structural holes, and innovation: A longitudinal study. *Administration Science Quarterly*, 45(1): 425-455.
- Aigner, S. M., Flora, C. B., & Hernandez, J. M. (2001). The premise and promise of citizenship and civil society for renewing democracies and empowering sustainable communities. *Sociological Inquiry*, 71, 493-507.
- Bebbington, A. (1999). Capitals and Capabilities: A framework for analyzing peasant viability, rural livelihoods and poverty. *World Development*, 27, 2021-2044.
- Chandrasekhar, A. G., Kinnan, C., & Larreguy, H (2011). *Informal insurance, social networks, and savings access: Evidence from a lab experiment in the field*. MIT Working Paper.
- Cook, T. D., & Campbell, D. T. (1979). Quasi-experimentation: Design and analysis issues for field settings. Chicago: Rand McNally.
- Emery, M., & Flora, C. (2006). Spiraling-up: Mapping community transformation with Community Capitals Framework, *Community Development*, 37 (1):19-35.
- Falk, I., & Kilpatrick, S. (1999). What is social capital? A study of interaction in a rural community. Australia: University of Tasmania.
- Hotez, P. J., & Pritchard, D. I. (1995) Hookworm Infection, *Scientific American*, 272, 68–75.
- Miguel, E., & Kremer, M. (2004). Worms: Identifying Impacts on Education and Health In The Presence of Treatment Externalities, *Econometrica*, 72(1): 159–217.
- Mitchnik, D. (1968). The need for a community development approach within the framework of agricultural development projects. *Community Development Journal*, 3(3), 134-138.
- Moody, J., & White, D. R. (2003). Group cohesion, nesting, and embeddedness. *American Sociological Review*, 68(1): 103-127.
- Owen-Smith, J., & Powell, W., W. (2004). Knowledge networks as channels and conduits: The effects of spillovers in the Boston biotechnology community. *Organization Science*, 15(1), 5-21.
- Rosenbaum, P., & D. Rubin (1983). The central role of the propensity score in observational studies for causal effects.” *Biometrika* 70, 604–20.

Rosenbaum, P., & Rubin, D. B. (1984). Reducing bias in observational studies using subclassification on the propensity score. *Journal of the American Statistical Association*, 79, 516-524.

Appendix B. Tables and Figures

Table 1

CDTP Program Objectives in Phases I, II & III

Phase	Phase I 1998-2002	Phase II 2003-2007	Phase III 2008-2012
Program Objectives	<ol style="list-style-type: none"> 1. Sustain household food security in the target area 2. Strengthen community capacity for self-initiative so as to increase the number of interventions managed by community stakeholders. 3. Establish an early warning, emergency response and monitoring system 4. Increased adoption of improved farming and livestock practices 5. Improve socio economic infrastructure to increase access to food and its utilization in the program area. Improved access to potable water, education, health services, etc. 6. Diversification of household incomes through micro finance/credit and training in marketing and elementary book keeping 7. Create awareness on gender, poverty and environmental issues 	<ol style="list-style-type: none"> 1. Enhance Food Security at household level: reduce the number of food deficit months from four to three, and reduce stunting from 20.8% to 10% 2. Increase agricultural production 3. Increase access to food 4. Improve community/ capacity health status 5. Reduce spread of HIV 	<ol style="list-style-type: none"> 1. Increase crop production. 2. Improve animal production 3. Increase households off farm income 4. Improve quality of education 5. Increase access to school 6. Increase equity of education for all children 7. Increase access to community health services 8. Increase access to potable water 9. Reduce rate of HIV infection 10. Enhance Registered children/ADP correspondence with SOs 11. Improve program management

Table 2

Distribution of Household Samples Based on Original Assignment

Cluster	N	%
A (HHs outside sponsorship kebeles)	235	35.7%
B (HHs w/i sponsorship kebeles, w/o RC)	130	19.7%
C (HHs w/l sponsorship kebeles, w/ RC)	294	44.6%

Table 3

The List of Covariates Chosen for the Propensity Score Matching

Variable Name	Label
age	Age of youth in years
male	If the child is male
FamSize	Number of people in the family
Land_access	If the family had access to land
irrigate	If the family practiced irrigation
row_plant	If the family used row planting for improving farming practices
deficit	If the family experienced food deficit
livestock	If the family owned any livestock
milk	Daily milk yield
income	Household income
asset_sale	If the family sold any assets
borrow	If the family borrowed any money
death	If parent or caregiver passed away
parent_ill	If parent or caregiver had been ill for more than 3 months
water	Water collected in a typical day
landsize	The size of land owned
income_pc	Household income per person

Table 4

The Comparison of Means and Standard Deviations of RC versus Non-RC Group Before Propensity Score Matching

Pre-Match	Treatment (N= 116)		Comparison (N= 282)		Standardized Difference	Absolute SD
Covariates	Mean T	SD T	Mean C	SD C		
age	14.53	2.38	14.81	2.05	-12.34	12.34
male	0.45	0.50	0.48	0.50	-6.09	6.09
FamSize	6.45	2.18	6.26	2.08	9.06	9.06
Land_access	0.91	0.28	0.95	0.24	-15.28	15.28
irrigate	0.13	0.41	0.05	0.26	23.27	23.27
row_plant	0.77	0.42	0.67	0.54	19.95	19.95
deficit	0.75	0.43	0.81	0.39	-15.00	15.00
livestock	0.82	0.39	0.79	0.41	7.96	7.96
milk	0.75	1.43	0.54	1.15	15.65	15.65
income	3411.56	6582.48	2539.93	7683.58	12.18	12.18
asset_sale	0.29	0.46	0.26	0.45	6.78	6.78
borrow	0.41	0.49	0.48	0.50	-13.05	13.05
death	0.04	0.20	0.05	0.21	-1.45	1.45
parent_ill	0.17	0.38	0.18	0.38	-1.28	1.28
water	34.25	15.68	34.32	35.91	-0.24	0.24
landsize	0.69	0.35	0.62	0.33	20.31	20.31
income_pc	554.70	786.66	441.71	1137.61	11.55	11.55
					Average	11.26

$$\text{*standardized difference} = \frac{100(\bar{x}_{treated} - \bar{x}_{control})}{\sqrt{\frac{s_{treated}^2 + s_{control}^2}{2}}}$$

Table 5

The Comparison of Means and Standard Deviations of RC versus Non-RC Group After Propensity Score Matching

Post-match	Treatment (N= 116)		Comparison (N= 116)		Standardized	Absolute
Covariates	Mean T	SD T	Mean C	SD C	Difference	SD
age	14.53	2.38	14.69	2.15	-6.85	6.85
male	0.45	0.50	0.45	0.50	0.00	0.00
FamSize	6.45	2.18	6.63	2.02	-8.61	8.61
Land_access	0.91	0.28	0.91	0.29	2.99	2.99
irrigate	0.13	0.41	0.09	0.36	11.18	11.18
row_plant	0.77	0.42	0.79	0.58	-5.07	5.07
deficit	0.75	0.43	0.73	0.44	3.92	3.92
livestock	0.82	0.39	0.82	0.39	0.00	0.00
milk	0.75	1.43	0.67	1.54	4.83	4.83
income	3411.56	6582.48	3649.89	11748.93	-2.50	2.50
asset_sale	0.29	0.46	0.32	0.49	-5.48	5.48
borrow	0.41	0.49	0.36	0.48	10.58	10.58
death	0.04	0.20	0.03	0.18	4.45	4.45
parent_ill	0.17	0.38	0.14	0.35	9.49	9.49
water	34.25	15.68	36.02	39.01	-5.94	5.94
landsize	0.69	0.35	0.67	0.33	4.24	4.24
income_pc	554.70	786.66	578.14	1704.67	-1.77	1.77
					Average	5.17